Journal *of* The Franklin Institute

ENGINEERING AND APPLIED MATHEMATICS

Volume 335B, 1998

List of Contents, Author and Subject Indexes

PERGAMON

Published on behalf of
The Franklin Institute, Philadelphia, U.S.A.

Journal *of* The Franklin Institute

ENGINEERING AND APPLIED MATHEMATICS

Aims and Scope of the Journal: The *Journal of The Franklin Institute* is a journal of electrical and computer engineering and the sciences that underlie them. Its focus is on information and communication systems, signal processing, wavelets, sensor fusion, computer and communication networks, neural networks, control theory, nonlinear dynamics, fractals, and chaos theory.

The Editors and the Editorial Board realize that no description of this kind can be comprehensive. They encourage authors to put forth evolving new topics for publication provided they fall within the current scope of the journal as noted above. Special focus issues with a strong theoretical foundation in newly evolving topics are planned for the future.

All submitted papers are peer-reviewed. The journal will publish original research papers and research review papers of substance. Papers are judged upon possible lasting value, which has been and continues to be the strength of the *Journal of the Franklin Institute*.

Publishing Office: Elsevier Science Ltd, Bampfylde Street, Exeter EX1 2AH, England [*Tel.* (+1392) 251558; *Fax* (+1392) 425370]. **Advertising Office:** Elsevier Science Ltd, The Boulevard, Langford Lane, Kidlington, Oxford OX5 1GB, U.K. [*Tel.* (+1865) 843000; *Fax* (+1865) 843010]

Author Service Department: For queries relating to the general submission of articles (including electronic text and artwork) and the status of accepted manuscripts, please contact the Author Service Department: *e-mail*: authors@elsevier.co.uk; *fax*: +44 (0)1865 843905; *Tel.*: +44 (0)1865 843900

Subscription Information

Annual Institutional Subscription Rates 1998: Europe, The CIS and Japan NLG 2442.00. All other countries US$1404.00. Associated Personal Subscription rates are available on request for those whose institutions are library subscribers. Dutch Guilder prices exclude VAT. Non-VAT registered customers in the European Community will be charged the appropriate VAT in addition to the price listed. Prices include postage and insurance and are subject to change without notice. Any enquiry relating to subscriptions should be sent to: **The Americas:** Elsevier Science Customer Support Department, P.O. Box 945, New York, NY 10010, U.S.A. [*Tel.*: (+1) 212-633-3730/1-888 4ES-INFO; *Fax*: (+1) 212-633-3680; *e-mail*: usinfo-f@elsevier.com]. **Japan:** Elsevier Science Customer Support Department, 9–15 Higashi-Azabu 1-chome, Minato-ku, Tokyo 106, Japan [*Tel.*: (+81) 3-5561-5033; *Fax*: (+81) 3-5561-5047; *e-mail*: info@elsevier.co.jp]. **Asia Pacific (*excluding Japan*):** Elsevier Science (Singapore) Pte Ltd, No. 1 Temasek Avenue, 17-01 Millenia Tower, Singapore 039192 [*Tel.*: (+65) 434-3727; *Fax*: (+65) 337-2230; *e-mail*: asiainfo@elsevier.com.sg]. **Rest of the World:** Elsevier Science Customer Service Department, P.O. Box 211, 1001 AE Amsterdam, The Netherlands [*Tel.*: (+31) 20-485-3757; *Fax*: (+31) 20-485-3432; *e-mail*: nlinfo-f@elsevier.nl].

Members' subscription. Members of The Franklin Institute may purchase the journal for their personal use only—prices on application. Copies bought in this way may not be placed in a library or in any way used as a substitute for a library copy purchased at the full price.

Back Issues: Back issues of all previously published volumes are available direct from Elsevier Science Offices (Oxford and New York). Complete volumes and single issues can be purchased for 1993–1997. Earlier issues are available in high quality photo-duplicated copies as complete volumes only. Back volumes on microfilm are available from UMI, 300 North Zeeb Road, Ann Arbor, MI 48106, U.S.A.

PERIODICALS POSTAGE PAID AT RAHWAY, NJ. *Journal of The Franklin Institute* (ISSN 0016–0032) is published 8 issues per year in January, March, April, May, July, August, September and November by Elsevier Science Ltd, The Boulevard, Langford Lane, Kidlington, Oxford OX5 1GB, U.K. The annual subscription in the U.S.A. is US$1404.00. *Journal of The Franklin Institute* is distributed by Mercury Airfreight International Ltd, 365 Blair Road, Avenel, NJ 07001, U.S.A. POSTMASTER: Please send address changes to *Journal of The Franklin Institute*, c/o Elsevier Science Regional Sales Office, Customer Support Department, 655 Avenue of the Americas, New York, NY 10010, U.S.A.

© 1998 The Franklin Institute, a Pennsylvania Corporation.

It is a condition of publication that manuscripts submitted to this Journal have not been published and will not be simultaneously submitted or published elsewhere. By submitting a manuscript, the authors agree that the copyright for their article is transferred to the Copyright holder if and when the article is accepted for publication. However, assignment of copyright is not required from authors who work for organizations which do not permit such assignment. The copyright covers the exclusive rights to reproduce and distribute the article, including reprints, photographic reproductions, microform or any other reproductions of a similar nature, and translations. No part of this publication may be reproduced, stored in a retrieval system or transmitted in any form or by any means, electronic, electrostatic, magnetic tape, mechanical, photocopying, recording or otherwise, without permission in writing from the copyright holder.

U.S. Copyright Law Applicable to Users in the U.S.A.

Photocopying information for users in the U.S.A. The Item-fee Code for this publication indicates that authorization to photocopy items for internal or personal use is granted by the copyright holder for libraries and other users registered with the Copyright Clearance Center (CCC) Transactional Reporting Service provided the stated fee for copying, beyond that permitted by Section 107 or 108 of the United States Copyright Law, is paid. The appropriate remittance of $19.00 per copy per article is paid directly to the Copyright Clearance Center Inc., 222 Rosewood Drive, Danvers, MA 01923, U.S.A.

Permission for other use. The copyright owner's consent does not extend to copying for general distribution, for promotion, for creating new works, or for resale. Specific written permission must be obtained from the Publisher for such copying.

Disclaimer. Whilst every effort is made by the Publisher and Editorial Board to see that no inaccurate or misleading data, opinion or statement appear in this Journal, they wish to make it clear that the data and opinions appearing in the articles and advertisements herein are the sole responsibility of the contributor or advertiser concerned. Accordingly, the Publisher, the Editorial Board and Editors and their respective employees, officers and agents accept no responsibility or liability whatsoever for the consequences of any such inaccurate or misleading data, opinion or statement.

The paper in this publication meets the minimum requirements of American National Standard for Information Sciences—Permanence of Paper for Printed Library Materials, ANSI Z39.48-1984.

ContentsDirect delivers the table of contents of this journal, by e-mail, approximately 2–4 weeks prior to each issue's publication. To subscribe to this free service complete and return the form at the back of this issue or send an e-mail message to cdsubs@elsevier.co.uk

The Item-fee Code for this publication is: 0016-0032/98 $19.00 + 0.00

PII:S0016–0032(98)00029–5

Contents of Volume 335B

Number 1

Part I: Special Issue on Antennas and Radar (14th Annual Benjamin Franklin Symposium)

EDITORIAL
Afshin S. Daryoush v

ADAPTIVE SPACE–TIME RADAR
Ronald L. Fante 1

MICROWAVE AND MILLIMETERWAVE APPLICATIONS IN AUTOMOTIVE ELECTRONICS—TRENDS
Rahul Dixit 13

THE QUADRANT/OCTANT MONOPULSE TECHNIQUE
J. M. Schuchardt and D. J. Martin 23

MINIMUM BIAS SPATIAL FILTERS FOR BEAMSPACE DIRECTOR-OF-ARRIVAL ESTIMATION
Moeness G. Amin and Nitin Bhalla 35

NEURO-MONTE CARLO SOLUTION OF ELECTROSTATIC PROBLEMS
Raymond C. Garcia and Matthew N. O. Sadiku 53

PERFORMANCE OF ADAPTIVE RADAR IN RANGE-HETEROGENEOUS CLUTTER
A. Futernik and A. M. Haimovich 71

COUPLING FROM A SINGLE MODE FIBER TO A III–V THIN-FILM WAVEGUIDE VIA MONOLITHIC INTEGRATION OF A POLYMERIC OPTICAL WAVEGUIDE
B.-H. V. Borges and P. R. Herczfeld 89

FINITE ELEMENT ANALYSIS OF AN ARRAY OF CYLINDRICAL RODS OR RECTANGULAR BARS BETWEEN GROUND PLANES
M. A. Kolbehdari and M. N. O. Sadiku 97

LINEARITY STUDY OF A FABRY–PEROT INTENSITY MODULATOR
Amarildo J. C. Vieira, Peter R. Herczfeld and Vincent M. Contarino 109

ENHANCEMENT OF OPTICAL SIGNAL MODULATION BY ATOMIC COHERENCE EFFECTS
M. A. G. Martinez, P. R. Herczfeld, L. M. Narducci and Charles Samuels 117

Part II: General Papers

GEOMETRIC METROLOGY I. SEPARATION FUNCTIONALS IN TOLERANCE ASSESSMENT
Mark J. Kaiser 129

GLOBAL PROPERTIES FOR A CLASS OF DYNAMICAL NEURAL CIRCUITS
Yuguang Fang and Thomas G. Kincaid 163

ANALYSIS AND OPTIMIZATION OF CONVECTIVE PIN FINS WITH TRAPEZOIDAL PROFILE HAVING INTERNAL HEAT GENERATION DENSITY
E. N. Georgiou 179

Number 2

Part I: Special Issue on Biomathematics

INTRODUCTION
Raymond C. Boston and Raymond Mejia v

FOREST-FIRE AS A MODEL FOR THE DYNAMICS OF DISEASE EPIDEMICS
C. J. Rhodes and R. M. Anderson 199

THE WATERS OF LIFE
Chao Zhang, S. Roy Kimura, Zhiping Weng, Sandor Vajda, Richard C. Brower and Charles Delisi 213

BIOMATHEMATICAL APPLICATIONS IN RUMINANT NUTRITION
J. France, J. Dijkstra, M. S. Dhanoa and R. L. Baldwin 241

DESIGN OF EXPERIMENTS
John A. Jacquez 259

PUBLISHING, INTERPRETING, AND ACCESSING MODELS
M. E. Wastney, X. Q. Wang and R. C. Boston 281

SPATIAL PATTERN FORMATION IN BIOLOGY: I. DERMAL WOUND HEALING. II. BACTERIAL PATTERNS
J. D. Murray, J. Cook, R. Tyson and S. R. Lubkin 303

Part II: General Papers

A NEW SET OF PIECEWISE CONSTANT ORTHOGONAL FUNCTIONS FOR THE ANALYSIS OF LINEAR SISO SYSTEMS WITH SAMPLE-AND-HOLD
Anish Deb, Gautam Sarkar, Manabrata Bhattacharjee and Sunit KR. Sen 333

UNIFORM DECOUPLING BY RESTRICTED STATIC STATE FEEDBACK FOR LINEAR TIME-VARYIING ANALYTIC SYSTEMS
K. G. Arvanitis 359

Cone-Angle Parametrization of the Array Manifold in DF Systems
H. R. Karimi and A. Manikas 375

A Remark on the Bellman Principle of Optimality
K. G. Garaev 395

Number 3

A Theory of Discontinuities in Physical System Models
Pieter J. Mosterman and Gautam Biswas 401

Orthogonal Functions Approach to the Analysis of Discrete-time Systems is Unnecessary
B. M. Mohan and K. B. Datta 441

Proposition of a Modeling Method for Constrained Mechanical Systems Based on the Vector Bond Graph
Jinhee Jang and Changsoo Han 451

Synthesis of Controllers for Arbitrary Pole Placement in Discrete Plants Including Unstable Zeros with Extensions to Adaptive Control
M. de la Sen and A. Peña 471

Output Tracking of a Class of Unknown Nonlinear Discrete-time Systems Using Neural Networks
J.-H. Horng 503

Robust $H\infty$ Controller Design for Linear Uncertain Systems with Delayed State and Control
Jingcheng Wang, Hongye Su and Jian Chu 517

On the Discrete Linear Quadratic Minimum-time Problem
N. el Alami, A. Ouansafi and N. Znaidi 525

A BIBO Stability Theorem for a Two-dimensional Feedback Discrete System with Discontinuities
Stelios Kotsios and Orla Feely 533

Minimum Zone Separation Functionals: The Spatial Case
Mark J. Kaiser 539

A Fast Robust LMS Algorithm Utilizing the Dynamics of a Damped Pendulum
T. F. Haddad and M. A. Khasawneh 563

Problems of Control of a Hopping Apparatus
Vladimir B. Larin 579

Number 4

AN INVERSE PROBLEM IN PREDICTING HEAT FLUX OF M42 PERCUSSION PRIMER
Ching-China Ji and Horng-Yung Jang 595

OPTIMAL DIGITAL REDESIGN OF CONTINUOUS-TIME SYSTEMS WITH INPUT TIME DELAY AND/OR ASYNCHRONOUS SAMPLING
I. E. Sheen, J. S. H. Tsai and L. S. Shieh 605

THERMAL BREAKDOWN IN SOLID DIELECTRICS: A NEW APPROACH
M. G. Danikas and G. Papaschinopoulos 617

WHAT IS THE MINIMUM FUNCTION OBSERVER ORDER
Chia-Chi Tsui 623

MULTIPROCESSOR SHARED MEMORY ACCESS AND REWARDS
Joann M. Paul and Marlin H. Mickle 629

BOND GRAPH REPRESENTATION OF MULTIBODY SYSTEMS WITH KINEMATIC LOOPS
Wilfrid Favre and Serge Scavarda 643

MEETING TRANSFER FUNCTION REQUIREMENTS VIA STATIC MEASUREMENT OUTPUT FEEDBACK
Fotis N. Koumboulis and Konstantinos G. Tzierakis 661

FREQUENCY DOMAIN ANALYSIS OF MECHANICAL VIBRATIONS IN AUTOMATIC ROLLING SYSTEMS
J. W. Perng, W. T. Tseng, K. W. Han, S. J. Tsai and C. H. Lin 679

ON α-STABILITY CRITERIA OF NONLINEAR SYSTEMS WITH MULTIPLE TIME DELAYS
Y.-J. Sun and J.-G. Hsieh 695

ON PRINCIPAL SUBSPACE ANALYSIS
Wei-Yong Yan 707

ASYMPTOTIC STABILITY OF TIME-VARIANT POLYNOMIALS WITH DIAMOND-SHAPED UNCERTAINTIES
Sandra A. Yost and Peter H. Bauer 719

ON THE OPTIMAL CONTROL OF LINEAR DISCRETE-TIME SYSTEMS VIA DISCRETE ORTHOGONAL FUNCTIONS
B. M. Mohan and K. B. Datta 731

THE SHIFTING OF MOVABLE EIGENVALUES IN UNCONTROLLABLE SINGULAR SYSTEMS
An-Ping Wang and Sheng-Fuu Lin 739

CLOSED LOOP STABILITY OF A CLASS OF NON-LINEAR SINGULARLY PERTURBED SYSTEMS WITH DISCRETIZED COMPOSITE FEEDBACK
S. Djennoune and A. El-Moudni 749

TWO TWIN-T BASED OP AMP OSCILLATORS MODIFIED FOR CHAOS
A. S. Elwakil and A. M. Soliman 771

SYNTHESIS OF UNCERTAIN CASCADED MULTIPLE LOOPS SYSTEMS WITH TIME DELAY
Sy-Kang Shen, Tsu-Tian Lee and Bor-Chyun Wang 789

Number 5

THE REALIZATION OF BOUNDARY CONDITIONS IN THE VIBRATION ANALYSIS OF PLATES
Tso-Liang Teng, Fwu-An Chang and Cho-Chung Liang 799

WEAK-STATIONARITY CONDITIONS FOR WAVELET PROCESSES
Shu-Ji Kawasaki 813

OPTIMAL DISCRETE-TIME CONTROL FOR NON-LINEAR CASCADE SYSTEMS
Wassim M. Haddad, Vijaya-Sekhar Chellaboina, Jerry L. Fausz and Chaouki Abdallah 827

NONLINEAR NONMINIMUM PHASE OUTPUT TRACKING VIA DYNAMIC SLIDING MANIFOLDS
Yuri B. Shtessel 841

BILATERAL DECOMPOSITION OF A TIME FUNCTION INTO LAGUERRE SERIES. APPLICATION TO LTI SYSTEM IDENTIFICATION
R. Malti, D. Maquin and J. Ragot 851

PARS'S ACCELERATION PARADOX
Y. H. Chen 871

A METHOD OF COMPUTING MINIMUM FIRING TIME FOR SELF-CLEANING SWITCH-LESS PROGRAM NETS
Qi-Wei Ge and Hidenori Yanagida 877

NAVIGATION AND CONTROL OF THE MOTION OF A ROLLING DISK CARRYING A CONTROLLED TRANSLATIONAL MOVING ROD
Y. Yavin and C. Frangos 897

TIME-FREQUENCY DISTRIBUTIONS BASED ON GENERALIZED CONE-SHAPED KERNELS FOR THE REPRESENTATION OF NONSTATIONARY SIGNALS
L. M. Khadra, J. A. Draidi, M. A. Khasawneh and M. M. Ibrahim 915

HIERARCHICALLY STRUCTURED NEURAL NETWORKS: A WAY TO SHAPE A 'MAGMA' OF NEURONS
Sergio Bittanti and Sergio M. Savaresi 929

ROBUST STABILIZATION OF LARGE-SCALE SYSTEMS WITH NONLINEAR UNCERTAINTIES VIA DECENTRALIZED STATE FEEDBACK
Jun-Juh Yan, Jason Sheng-Hong Tsai and Fan-Chu Kung 951

STABILIZATION AND REGULATION OF CLASS OF NON-LINEAR SINGULARLY PERTURBED DISCRETE-TIME SYSTEMS
R. Bouyekhf and A. El Moudni 963

ON THE RELATION BETWEEN THE TEST CELL ENERGY DELIVERY AND THE SMOOTHING OUT OF THE ELECTRODE MICROPROTRUSIONS IN VACUUM INSULATION
M. G. Danikas 983

Number 6

BUCKLING LOAD RELATIONSHIP BETWEEN REDDY AND KIRCHHOFF CIRCULAR PLATES
Chien-Ming Wang and Kwok-Hong Lee 989

NOVEL OSCILLATORS USING CURRENT AND VOLTAGE FOLLOWERS
A. M. Soliman 997

BUCKLING OF UNILATERALLY CONSTRAINED PLATES: APPLICATIONS TO THE STUDY OF DELAMINATIONS IN LAYERED STRUCTURES
K. W. Shahwan and A. M. Waas 1009

GRAPH THEORETIC AND BOOLEAN CONDITIONS FOR STRUCTURALLY FIXED MODES OF AUGMENTED SYSTEM FORMS
D. S. Evangelatos 1041

AN INTEGRATED METHOD IN WAVELET-BASED IMAGE COMPRESSION
Hung-Hseng Hsu, Yi-Qiang Hu and Bing-Fei Wu 1053

INCLUSION ISOTONICITY FOR CIRCULAR CENTERED FORMS IN SEVERAL COMPLEX VARIABLES
Qun Lin and J. G. Rokne 1069

PHYSICAL AND GEOMETRICAL INTERPRETATION OF FRACTIONAL OPERATORS
M. Moshrefi-Torbati and J. K. Hammond 1077

COMMENTS ON "DELAY-INDEPENDENT STABILITY CRITERIA FOR DISCRETE UNCERTAIN LARGE-SCALE SYSTEMS WITH TIMES DELAYS"
Tao Yang 1087

ANALYSIS OF DISPOSITION ALTERNATIVES FOR RADIOACTIVELY CONTAMINATED SCRAP METAL
L. A. Nieves, S. Y. Chen, E. J. Kohout, B. Nabelssi, R. W. Tilbrook and S. E. Wilson 1089

ON NONLINEAR DETECTABILITY
G. L. Amicucci and S. Monaco 1105

DISTURBANCE REJECTION IN MULTIVARIABLE SYSTEMS BY STATE FEEDBACK CONTROLLER
Salem A. K. Al-Assadi 1125

EDGE-PRESERVING SMOOTHING USING MEDIAN MEAN NEURAL HYBRID FILTERS
M. Muneyasu, K. Hotta, T. Hinamoto and A. Taguchi 1145

THE COMPUTATIONAL EFFICIENCY OF A SPECTRAL WALSH FUNCTION METHOD
B. G. Sloss and W. F. Blyth 1157

Number 7

RANDOM DELETION MODEL AND RAINVILLE'S GENERATING FUNCTION FOR THE LAGUERRE POLYNOMIALS
P. A. Lee 1171

A NOVEL NONLINEAR FILTER USING LAYERED NEURAL NETWORKS
Mitsuji Muneyasu, Takahiro Maeda, Tomonori Yakao and Takao Hinamoto 1177

A REALIZATION OF 2-D ADAPTIVE FILTERS USING AFFINE PROJECTION ALGORITHM
Mitsuji Muneyasu, Takao Hinamoto and Hideyuki Yagi 1185

KALMAN ESTIMATION WITH BROWNIAN DISTURBANCES
Eduard D. Aved'Yan, Yakov Z. Tsypkin and Sergio Bittanti 1195

ON INITIAL JUMPS FOR SINGULAR SYSTEMS IN CONNECTION WITH LQ OPTIMAL CONTROL
W. Q. Liu, K. L. Teo, W. Y. Yan and V. Sreeram 1207

STATIONARIZATION OF STOCHASTIC SEQUENCES WITH WIDE-SENSE STATIONARY INCREMENTS OR JUMPS BY DISCRETE WAVELET TRANSFORMS
Yu-Lin Su and Bing-Fei Wu 1215

ELASTIC PLATE IN GAS FLOW: REDUCING FROM ANISOTROPY TO ORTHOTROPY
S. D. Klyachko 1231

ROBUST STABILITY ANALYSIS OF TIME-DELAY SYSTEMS USING PARAMETER-PLANE AND PARAMETER-SPACE METHODS
Gong-Liang Chao, Jau-Woei Perng and Kuang-Wei Han 1249

ENERGY AND MASS-DIMENSIONAL CHARACTERISTICS OF LC FILTERS
Ahmad Ali Al-Noman 1263

ESTIMATION OF THE PRACTICAL STABILITY REGION OF A CLASS OF ROBUST CONTROLLERS WITH INPUT CONSTRAINT
Shou-Tao Peng and Cha'o-Kuang Chen 1271

GENERATION OF CURRENT CONVEYOR BASED LOWPASS FILTERS FROM A PASSIVE RLC FILTER
Ahmed M. Soliman 1283

Disturbance Rejection with Simultaneous Linear Exact Model Matching for a Class of Nonlinear Systems
A. S. Tsirikos and P. N. Paraskevopoulos 1299

Entropy of Markovian Processes: Application to Image Entropy in Computer Vision
Guy Jumarie 1327

Number 8

Part I: Special Issue on Applications of Digital Signal Processing

Guest Editorial 1339

Optimal Waveforms for Wideband Radar Imaging
S. M. Sowelam and A. H. Tewfik 1341

Multi-dimensional Filter Banks and Wavelets—A System Theoretic Perspective
S. Basu 1367

Motion Estimation Methods for Video Compression—A Review
A. J. Tabatabai, R. S. Jasinschi and T. Naveen 1411

Part II: General Papers

Using Bond Graphs to Synthesize Tree-structured Transfer Functions: Improved Frequency-Domain Analysis of Uncertain Systems
B. H. Wilson and B. Eryilmaz 1443

On Explicit Equations of the Burmester Curves for the PPP-P Case in Spherical Motion
Deng-Maw Lu 1467

Optimal Control of a Class of Time-delayed Distributed Systems by Orthogonal Functions
S. A. Bianco, I. S. Sadek and M. T. Kambule 1477

Thermal Modeling of Steady State Contact Resistance Between Two Dissimilar Materials
S. Y. Vaidya and A. Razani 1493

Balanced Realization using an Orthogonalization Procedure and Modular Polynomial Arithmetic
S. Azou, P. Vilbe and L. C. Calvez 1507

Volume 334B, 1997 Contents, Author and Subject Indexes i

Volume 335B, 1998 Contents, Author and Subject Indexes I